

Carolus Linnæus

CAROLVS LINNAEVS

BY

EDWARD LEE GREENE
Ph B LLD

FORMERLY PROFESSOR OF BOTANY
IN THE VNIVERSITY OF CALIFORNIA

Author of

PITTONIA

Leaflets of Botanical Observations
Landmarks of Botanical Science &c

with an

INTRODVCTION

by

BARTON WARREN EVERMANN Ph D

Author of

AMERICAN FOOD AND GAME FISHES THE
FISHES OF PORTO RICO
Lopho the Quail &c



PHILADELPHIA
CHRISTOPHER SOWER
C O M P A N Y

COPYRIGHT, 1912, BY
CHRISTOPHER SOWER COMPANY

CONTENTS

	PAGE
INTRODUCTION.	5
LINEAGE AND CHILDHOOD OF LINNÆUS.	7
SCHOOL, COLLEGE AND UNIVERSITY YEARS	21
JOURNEY TO LAPLAND	38
JOURNEY TO GERMANY AND HOLLAND	39
PRACTISES MEDICINE IN STOCKHOLM	48
APPOINTED PROFESSOR AT UPSALA	51
INFLUENCE OF LINNÆUS UPON BOTANY	52
LINNÆUS AS A ZOÖLOGIST	67
LINNÆUS AS AN EVOLUTIONIST	73

INTRODUCTION



THE chapters comprising this little volume consist, primarily, of an address delivered by Dr. Edward Lee Greene at a joint meeting of the Washington Academy of Sciences, the Biological Society of Washington and the Botanical Society of Washington, held at Hubbard Memorial Hall, on the occasion of the two hundredth anniversary of the birth of Carl Linné (Carolus Linnæus), May 23, 1907.

The chapter on Linnæus as a zoölogist was contributed by Dr. William Healey Dall as a part of the same memorial exercises. The chapter on Linnæus as an evolutionist was published by Dr. Greene in the Proceedings of the Washington Academy of Sciences, Vol. XI, March 31, 1909.

The two addresses and the special paper are all here printed in the form in which they were originally presented and practically without revision.

It may be doubted if any naturalist has exerted a greater influence in the world than has Linnæus; certainly none other has given

to the study of animals and plants an impetus so far-reaching or so long-sustained.

Whatever we may claim to have been accomplished by those naturalists who preceded him, we must admit that to Linnæus we owe the essential features of our present system of naming the various species of animals and plants, and it is not too much to say that Linnæus is the father of systematic zoölogy and botany.


The personality, the biography, of one who has done great things in the world is always interesting. The study of the lives of such men is one of the most potent factors in moulding the life of the student, filling it with clean ambitions and leading to right thinking and rational living.

Professor Greene has told the story of the life of the great Swede in a way that will prove not only entertaining and instructive to all who are interested in Nature, but also in language delightful in its simplicity and literary charm.

BARTON WARREN EVERMANN.

✿ CAROLUS LINNÆUS ✿

LINEAGE AND CHILDHOOD OF LINNÆUS

HE personality of Linnæus and his luminous career as a scientific man make a topic much too large to be presented even in mere outline within the limits of an hour. If this were an assemblage of botanists exclusively, still would the time be too short for the worthy consideration, not only of Linnæus as a botanist in general, but of his services to any one only of the several departments of the science which it is his glory greatly to have advanced. But then a botanist, a very great botanist, he was also much more than that. I have a fancy—it may be more and deeper than a fancy—that a great man in whatsoever profession, a man of power in any branch of science, is greater than the science to which he devotes himself; that he himself personally is of more moment, and ought to be of deeper interest than his science; yes, than all the sciences that are or ever shall be.

If we could in thought divest Linnæus of his systematic botany and zoölogy, we should

still find ourselves in the presence of a man of the highest educational accomplishments and general culture, clear-headed and original as a thinker, a philosopher, religionist, ethnologist, evolutionist, traveller, geographer, and a most able and polished man of letters. These are but so many more aspects of a great character, the presentation of which, one by one in a discourse, might interestedly engage the attention of others besides nature students.

Confronted by so very much that may be said, and which it might seem ought to be said on this day dedicated to Linnæus, and checked by the consideration that only a few selections from out the whole mass may at this hour be taken, where shall one begin? Whither shall one proceed? What thrilling passages in a career so almost marvellous shall be left unnoted for want of time, and of what few of them shall the rehearsal be attempted? Or, reducing these questions down to two: Shall the *man* be presented with citation of his struggles with adverse circumstance, and of the almost incredible patience, industry, zeal and resolution with which he conquered and rose to high renown? Or shall one consider rather the *work* of the great master of botanical theory and taxo-

onomic abstraction? There will not now be time for both; not even though attempted in mere outline. My own inclinations favor choice of the latter, especially for today; yet circumstances indicate that such a choice would here be also inopportune. Our Washington botanists at this season of the year are mostly far afield in the service of the government. Only a fair delegation of my colleagues in this science is here present; and this enlightened audience as a body I am persuaded would much rather hear something more about the *man* of whom all the world of education and of culture has heard more or less. Even on my own part I have already expressed the view that the *man* should first be known, that we may the better comprehend his deeds.

When Linnæus, on the twenty-third of May two hundred years ago, was born, I think it had long been predetermined that he should be a botanist, and one of high distinction. When I say predetermined, I do not use the word in any sense of theological predestination or of astrological forecast. I have but the recognized principles of natural heredity in mind. And, unless I err, there was more inherited by Linnæus than his biogra-

phers seem to have guessed. They all repeat it that the father, the Reverend Nils Linnæus, a Swedish country clergyman, was fond of plants, and had a choice garden wherein he took his daily pastime; and that in this garden his first-born child developed those predilections which at length became the despair of the father, yet led the son eventually far up the heights of fame. All this is authentic, and well told by the several biographers; but there is more in that history which, to me, seems well worth telling, and will give light upon the derivation of Linnæus's genius as a botanist and upon his accomplishments as a man of learning and of letters. Let us go back to the second generation of his ancestry and glance at men, women and social conditions.

The grandfather of Linnæus, on his father's side, was a Swedish peasant, by name Ingemar Bengtson. His wife had two brothers who became university graduates, were afterwards clergymen of some distinction, and men of reputation in the world of learning. These granduncles of our Linnæus interest us because of their having figured somewhat conspicuously as stars of destiny in relation to him long before his birth. They even had

somewhat to do with the originating of the family name Linnæus. But for their influence in this direction it is probable that their grandnephew, then unborn, distinguishing himself as he did, would have been known in history not as Carolus Linnæus but by some other name. That both these granduncles of Linnæus were Greek scholars seems attested by the fact that, in assuming a new family name, after the mediæval usage of those who arose from the humble estate of peasantry to the aristocracy of learning, they chose the Greek name Tiliander. They were Karl and Sven Tiliander. In their boyhood they had been known simply as Karl and Sven Svenson, and if they had remained uneducated, and in the same lowly and simple estate in which they were born, they would have been known by those names to the end of their lives. Karl Tiliander rose to wealth and station, adopted a coat of arms, in a word, was an aristocrat, but died childless. His grandnephew, however, born ten years after his death, was named in his honor. In fact, Karl Tiliander and Karl Linnæus are, in meaning, the same name precisely. Now the other greatuncle, Sven Tiliander, was a

minister, had a family of minister's sons to educate, and was generous enough to receive as one of his own sons his sister's son Nils, to be educated with them. This peasant boy, Nils Ingemarsson, remember, is the predestined father of our Linnæus. But this boy's school scene, lying away back almost upon the edge of mediæval times, and afar in the north of Europe, well towards the country of the midnight sun, is a pleasant scene, before which we must pause a moment. It is in the midst of a time when great people may lead simple lives, and when a family group of boys, destined if possible to the intellectual life—and at least to one of the learned professions, are not at first to be sent away from home. They live under the parental roof, and their Latin tutor lives there with them. Latin is the language in which, later at college and at university, lectures on all subjects will be given; it will be the language in which most of the books there used are printed; the language of recitation and of student debate.

So these small boys at home begin Latin. They also so begin it as if they were to become interested in it, and really to learn the language, and not to end with a mere smattering

of it. They are to speak it as well as read and write it. Therefore it becomes at once, in so far as possible, the medium of spoken intercourse between tutor and pupils; the father of the family himself incidentally aiding the tutor, by addressing the youngsters at meal time or recreation in Latin, and requiring them to answer in that, and not in the mother tongue. It was a serious business; the entrance to college, the matriculation at any university, the rising to any learned profession even, are dependent upon the boys having made good progress in the acquisition of this, at that time the universal language of the educated. The Swede or Finlander even, if a college man, might visit every country of Europe, and converse with the men of the colleges and universities everywhere, without learning one of the modern languages. Linnæus even, two generations this side of the epoch of his greatuncles, the Tilianders, did this. Now among this aristocratic caste of the learned, in mediæval times and later, it was almost the universal custom with men of lowly origin to drop the ancestral family name and assume a Latin one. It was the fashion of the time; and, as I have said, the time lasted through many centuries. When Latin was

the language of a certain social caste, and the language of almost all authorship, the canons of good taste seemed to require that the author of a book in Latin should put his name in Latin on the title page, and not in some barbaric Teutonian or Russian or Scandinavian or English form to which, as to a plebian inheritance, he might chance to have been born. Such is the origin of the general circumstance, familiar to all botanists, that nearly all the thousands of volumes of botanical literature that antedate the beginning of the nineteenth century are by authors whose names are plainly Latin names. The same is true of the earlier literature of all our sciences. It was all in Latin; and the authors' names are Latin names.

The greatest name in astronomy, but for the man's Latinization of it on the title page of his immortal book, would have come down to posterity as Kupernik. But all astronomers, and all other people besides, should be grateful that, the book being in Latin, he wrote himself not Kupernik but Copernicus. The most illustrious of old-time Chinese sages was and is known to his countrymen as Kung-fu-tsee; but the Latin scholars who, some centuries ago, first brought him to the

notice of the western world, wisely and tastefully Latinized Kung-fu-tsee to Confucius. A single generation earlier than Linnæus there flourished in Germany one of the greatest botanical celebrities which that country has produced. His splendid folios are now so rare that only the choicest botanical libraries of today are able to catalogue a set of them; and they were very helpful to the young Linnæus. This famous German, as a boy, and before his college days, rejoiced in the plain everyday Teutonian name of August Bachman. Afterwards as professor of botany at Leipzig, and the author of immortal books of botany in Latin, he assumed the most perfect counterfeit of an ancient classic Latin personal name which I can recall. This August Bachman is known in history and to fame as Augustus Quirinus Rivinus. The name Rivinus was arrived at in the simplest kind of a way; for it is nothing but Bachman—the man who dwells by a rivulet or brook—translated into Latin. Now just as Rivinus—in German Bachman—recalls a stream-bank where the Bachman family lived, so those forebears of Linnæus who, on rising to the rank of gentry, took the Græco-Latin name Tiliander, chose that improved appella-

tion in allusion to an object in the landscape near their home. That object was a remarkably large and ancient linden tree; a tree of special note all over that part of the country. Tiliander—Lind-tree-man; or more in brief, Linnman. In Swedish it would be Lindman. So these two learned brothers who became the head of the Swedish family of the Tilianders, chose a botanical name; incidentally presaging the botanical halo that was to glorify a future scion of their stock under the same name somewhat altered. Now if the name Tiliander was prophetic incidentally it had not been chosen accidentally.

The Reverend Sven Tiliander, uncle and foster-father of the father of Linnæus, was a devoted lover of trees and plants. It was that passion for botany which determined his taking the new and classic-sounding family name from the great linden tree. At the time of his taking his nephew Nils Ingemarsson into his family to make of him if possible a scholar and a Lutheran priest, he had extensive orchards and gardens, to the care and improvement of which he was enthusiastically devoted. This enthusiasm for such things became contagious in the case of his nephew Nils, inasmuch that the boy found delight in going

with his uncle and helping him in orchard and garden. Twenty years or so afterwards, this nephew, now a learned graduate and assistant minister of a parish, as the Reverend Nils Linnæus—no longer Nils Ingemarsson—had become so deeply imbued with the love of the beautiful things of the plant world, that he began the establishment of orchard and gardens on the parish farm when his residence was established. A word here as to his new name Linnæus, which had now displaced that peasant's name Ingemarsson to which he had been born. Reared and educated along with his first cousins, the Tiliander boys, it may be assumed the whole family may have thought it better that, as scholar and gentleman, he should take some other name than Tiliander. At all events, and quite as if in grateful love of his uncle and cousins, he took a name precisely the equivalent of theirs—the name of Linnæus. It is not quite as elegant in its construction as Tiliander, but its meaning is just the same. It is another way of turning Lindman into Latin. And so Nils Ingemarsson, by changing his name to Linnæus, paid high compliment to that uncle and benefactor, Sven Tiliander, to whom he owed so very much, commemorated again

that ornament of the northern landscape, the great linden tree, and supplied to all scientific posterity the illustrious and immortal name Linnæus. In view of this, that the most signal and lasting service that the great Linnæus rendered botany was the reform he wrought in the Latin nomenclature of plants, the derivation of his own name, its botanical origin and character, can not fail to be of interest to all who, on this his two-hundredth natal day, unite in celebrating his imperishable fame.

The Reverend Nils Linnæus was no sooner married and settled in the charge of a parish than he began the creation of an orchard and garden, following the inspiration he had received in boyhood while under the benign influence of his uncle, the Reverend Sven Tiliander. When Nils Linnæus's garden had been four or five years established, the proprietor began to lead within its precincts his first-born child, a small white-haired boy, active and intelligent beyond the average, for his years. Flowers, beyond all things else, were this small child's delight. Even at the age of four years he knew the names of all the familiar kinds. On a May day picnic excursion that the pastor gave the children

of the parish, to a wild and beautiful spot some few miles away, this botanical nomenclator that he was to be, nearly monopolized the pastor's time with questions of plant names. Many kinds, to him until now unknown, and therefore nameless, he must have names for. Some of them were forgotten within an hour, and were brought again. The father's patience gave way a little, and the threat was made that unless Master Karl Linnæus was more careful to remember them he would get no more plant names at all. If the Reverend Nils Linnæus had thought it time to begin to check his child's extraordinary zeal for plant knowledge, this was the wrong way to go about it. That threat, though a mild one, would be sure to have the opposite effect. If the infant had inherited the father's temperament, the matter would have been unimportant. I may rather say that, if the child Linnæus had been of the father's temperament, this restless activity and burning zeal, whether for plants or for anything else under the sun, would not have been there, and that small white-haired Scandinavian child's birthday would not have been celebrated on two or three continents, after two hundred years.

If a paradox like this may be ventured, one may say that the fatherhood of a great man must, in many an instance, be credited to the mother. The man of power and influence may have for his male parent one of quiet retiring manner, unaggressive, unambitious, and even slow, if the mother be very decidedly of the opposite temperament—active, energetic, ambitious, ardent, and also young, strong and in perfect health. Just these conditions prevailed at the nativity of Linnæus. The strong character in that household was the mother, Christina Broderson Linnæus. It is safe to infer from her antecedents that she was a woman of refinement and perhaps unusual mentality. She may almost be said to have had none but cultured men among her ancestry for three generations back. We have already seen that her husband was her father's successor in the Stenbrohult pastorate. Her father had not only been pastor there all his official life, he had been born there, as the son of the pastor whom he in turn succeeded; so that her father and her grandfather had been pastors of that parish all their lives—so to speak—while the priest who preceded her paternal grandfather in that same church had been her great-grandfather on her mother's

side. Realizing now that, when in the nineteenth year of her own age, Christina Linnæus's first-born arrived at the parsonage where both she and her father before her had been born, where a grandfather of hers and even a great-grandfather had held life-long pastorates, we pardon the ambition of the young mother who set her whole heart and soul upon the plan of having this her first-born trained and fitted to inherit that pastorate already historically so remarkable; of which history she could not but be proud.

SCHOOL, COLLEGE AND UNIVERSITY YEARS

The mental training of the child Linnæus was, of course, begun at home. At seven years of age he was well enough advanced to have a tutor. At ten he was sent away to a Latin school and theological preparatory at Wexiö, not many miles from home. After eight years there, the progress made in studies looking to the office of a Lutheran ecclesiastic seems not to have been satisfactory; and now the Reverend Nils Linnæus came journeying to Wexiö. The instructors whose duty it had been to train the boy in Hebrew and

biblical learning had failed to interest him; and they said to the father that they could not, on their consciences, advise him to continue the youth at school. In their view it would be better at once to apprentice him to the learning of some handicraft; that of carpenter or tailor, for example. Doubtless this counsel would have been followed, but that Pastor Linnæus had another errand at Wexiö that must be attended to before the disheartened return to Stenbrohult, whither, as it now seemed, he would have to convey his son, now eighteen years old, as withdrawn from college because of his having no taste for learning; that is, theological.

Pastor Linnæus's other errand was that of placing himself under the direction of an eminent physician of Wexiö as to an ailment of his. The physician was Dr. Rothman, who was also a lecturer on medicine at the college; and this man, as it happened, both knew and was much interested in the youthful member of the Linnæus family. When the father confidently mentioned his deep grief over his son's failure at school, Dr. Rothman was able to cheer him with a very different account of his boy's proficiency. He was so confident that out of this bright youth a great physi-

cian might be made, that he proposed to receive him, with the father's consent, into his own house for a year, and give him special instruction, free of all charge; and this was done.

Now while making himself the despair of his tutors in Hebrew and theology, what had the young Linnæus been accomplishing all these years? The idler which these thought him, he had not been. In mathematics and physics he was quite distinguished; moreover, his student comrades called him always the little botanist, thus by chance conveying the information that, as a youth of eighteen years, Linnæus was small of stature, and as much as possible given to botanizing. He has told us himself that, during all his years at Wexiö, the red-letter days were those of his occasional walks across the country thirty miles to the home at Stenbrohult, which gave opportunity to study the wild plants of the waysides. He had also acquired certain books on botany—Swedish local floras—in the study of which he had busied himself day and night until he almost knew them by heart, as he assures us. The titles of at least three of those books, and especially their authors' names, must needs be given on a Linnæan bicentenary that

is celebrated in America. The fitness of this mention you shall see. One of the books was Rudbeck's *Hortus Upsaliensis* (1658); another was Tillandsius's *Flora Aboensis* (1673); the third Bromelius's *Chloris Gothica* (1694). It was to the grateful memory of these Scandinavian botanists, Rudbeckius, Tillandsius and Bromelius, all of them dead before Linnæus was born, that he, in the days of his own fame, consecrated those fine American genera, *Rudbeckia*, *Tillandsia* and *Bromelia*. These men, by their books, had been his teachers of botany while he dwelt at Wexiö between the eleventh year of his age and the nineteenth. It is true that the works of these men were not of the nature of what would now be called scientific botany; that is, the plants discussed were not arranged according to any notion of their affinities. The order followed was either that of the alphabetic order of their names, as in a common dictionary, or else, if they were grouped at all, the grouping was according to their medicinal properties or other economic uses. All these books, so much beloved and revered by the youthful Linnæus, had been published before Tournefort, who, practically, and at least for the time immediately antecedent to

Linnæus, was the father of natural system in botany.

It was as an inmate of Dr. Rothman's household, and while preparing under his direction to enter some university as a candidate for the doctorate in medicine, that a new day dawned upon Linnæus's horizon in respect to his botanical recreations and pursuits. The botanical system of Tournefort had now been before the public for some thirty years. His work was the most complete and signal success that ever had been, and I may almost say that ever yet has been, in the field of botanical authorship; because it seems to have captivated the whole botanical world, without arousing a jealous enemy, or eliciting a line of adverse criticism for twenty years, save only a mild protest from the gentle John Ray, in England, who, clearly superior to Tournefort as a botanist, never measured half the latter's success as an immediate and popular influence. Viewed without bias of prejudice, and in the perspective of two centuries, Tournefort's *Institutes* becomes the most conspicuous landmark in the whole history of botany. By no other one author's help did the science make a stride in advance equal to that made under Tournefort's influence

between the years 1694 and 1730. It is important that these things be taken note of here. On the day when Linnæus was born, two hundred years ago, Tournefort's dazzling star was high on the botanical horizon. It was at its meridian when, at eighteen years of age, Linnæus fell under the benign influence of Dr. Rothman at Wexiö. This man made no pretensions to botany, beyond what any first-class practising physician of that period had to know; but he had full knowledge of the great fame of the Parisian, Tournefort, and had in his library the German Professor Valentini's¹ abridgement of Tournefort's Elements. Dr. Rothman had evidently studied Tournefort and been fascinated with his system. Linnæus the youth, away in the distant north, the pupil of none but theologians, had not so much as heard of Tournefort. Rothman told him frankly that all his recreations with plants were little better than wasted time unless he should begin to recognize them as interrelated by characters of their flowers, as Tournefort had taught.

From the day when Dr. Rothman placed

¹ VALENTINI (Michael Bernhard), professor of Giessen. Tournefortius Contractus, Frankfurt am Main. 1715, folio, 48 p., 4 tab.

in his hands Valentini's key to the twenty-two Tournefortian classes of plants, the young Linnæus bent his energies in botany to ascertaining by their organographic marks to what one of the classes of Tournefort each plant that he found belonged. It was a day that completely and most happily revolutionized this brilliant youth's conception of the plant world, as well as his method of investigating it. It was in fact the day when Linnæus, according to his own testimony about it, first began to be a botanist; and thence-forward the illustrious Parisian had never a more zealous disciple, until after some years the ardent disciple began, and in some respects deservingly, to supersede the master. It is hardly to the praise of Linnæus that in after life, when at the height of his own resplendent fame he was dedicating a genus of plants to each of his chief benefactors of earlier days, he forgot good Dr. Rothman. This man had been the first, and perhaps the most important of them all, even from the viewpoint of botanical training. It was certainly he who, as far as one can see, saved the boy Linnæus from oblivion when his own father had resolved to apprentice him to a cabinet-maker or tailor. It was he who,

having assumed as it were sponsorship for Linnæus as candidate for a career in science, placed in his hands the first book of real botany that the youth had ever seen, and taught him how to begin to be a botanist; introduced him to the illustrious Tournefort, who at once became the lodestar of Linnæus's own genius for years to come. Yet to the end of Linnæus's days there was no genus *Rothmania*. Professor Thunberg, once a pupil of Linnæus at Upsala, and long afterwards a successor of his in the chair of botany there, made tardy reparation to the neglected memory of Dr. Rothman, after both benefactor and beneficiary were dead.

After one year under Dr. Rothman's patronage and instruction it was thought advisable that Linnæus should enter the university at Lund. In connection with the transfer from Wexiö to Lund there was an illustration of how, in the extremities of their need, fortune favors at every turn the men of genius and of high destiny. It was requisite that the candidate should carry a formal letter of transfer from the head master of Wexiö Academy to the rector of the University at Lund. The head of the Wexiö school, a professor of divinity, must have been the self-same who, one

year before, had counselled Nils Linnæus to abandon all hope of Karl's ever becoming a clergyman, to take him home and apprentice him to the learning of some useful handicraft. To this man young Linnæus had to make application for the necessary credentials. As a matter of routine duty, the letter was indited promptly and handed to the applicant. It was brief and rhetorical; and, whether by chance or of deliberate purpose, the figure of speech employed was botanical. "Boys at school," he writes, "may be likened to young trees in orchard nurseries; where it will sometimes happen that here and there among the sapling trees are such as make little growth, or even appear like wild seedlings, giving no promise; but which when afterwards transplanted to the orchard, make a start, branch out freely, and at last yield satisfactory fruit."

On reaching Lund, Linnæus first of all paid his respects to Professor Gabriel Hoek, who some years before had been an esteemed tutor of his in the earlier days at Wexiö. This gentleman was so much pleased at seeing young Linnæus there as a postulant for admission to the university, that he at once, and in complete ignorance of that humiliating

letter, proposed to himself the pleasure of introducing in person his former pupil to the rector Magnificus and also to the dean, and asking that he be registered as his own former pupil. This done, good Professor Gabriel Hoek, like a veritable angel guardian and helper, and knowing the indigence of Linnæus, went farther and procured for him free lodgings under the hospitable roof of one Doctor Kilian Stobæus.

Doctor Stobæus, at the time only a practising physician to the nobility and gentry at Lund and the regions round about—though afterwards one of the head professors at the university—at first saw in young Linnæus but an indigent student with the profession of medicine in view, his only possessions seeming to be a few books of medicine. But the student, on the other hand, found the Stobæus domicile a wonderful and fascinating place. There was a library, evidently precious because it was kept locked. There were, however, open to any one's inspection, a number of cabinets of natural history; collections of minerals, shells, birds, and—what Linnæus, though he was now twenty years old, had never before seen—an herbarium; a collection of pressed and dried botanical

specimens. On this suggestion Linnæus at once began making an herbarium of his own; its contents being the plants of Lund and its vicinity. But what he wished, far beyond anything else, was access to the library, though he did not dare ask for the privilege. There he would be sure to find the works of Tournefort, original and unabridged, and even older and rarer standards of the best botany. The privilege came at last, and in a remarkable manner; by a chain of circumstances that demonstrates the young Linnæus's irrepressible zeal and most unexampled industry in acquiring knowledge of botany.

Doctor Stobæus, the owner of the first museum of natural history that Linnæus had beheld, was, by Linnæus's account of him, not only of great learning and of surpassing skill in the healing art, but also himself a feeble sickly man, having but one eye, being also crippled in one foot, and a gloomy hypochondriac. A student or two in his household was a necessity. Much of his medical practice was by correspondence, and on some of the professional visits the student must be sent. At the time of Linnæus's coming a medical student from Germany had long been Dr. Stobæus's main dependence for help; was

thoroughly trusted, and his right-hand man. This older student the magnetic young Linnæus in an innocent way, and half unconsciously, appears to have at first captivated and then bribed into helping him in respect to that which he now most desired.

An old and honored inmate of the doctor's household was his mother. She was a nervous, fretful old lady, much troubled with sleeplessness. A window of young Linnæus's room was visible from where she tried to sleep, and she observed that, after this new-comer had been in the house some weeks, a light seemed to be left burning in his room, if not all night, at least until well towards morning, when presumably it had burnt itself out. She reported the case to her son, and insistently, as a thing that ought by all means to be stopped. The whole house was in danger of destruction by fire. Dr. Stobæus had knowledge of students and their ways. In his own mind he doubted that this was a case of sleeping with the candles burning. He entertained a suspicion that the two companion youths would be found there, recreating themselves with cards in the small hours of the night. At two o'clock next morning, the room of young Linnæus being illuminated, the doctor

quietly made his way to the door, opened it and went in. The young man was found alone at his study table, which was covered with open books. A step nearer the table disclosed the interesting and not readily accountable fact that all were books on botany, and out of Stobæus's own library that was always kept securely locked. To the question how he obtained those books from the locked library Linnæus answered in brief, and very frankly, that the other student had desired of him a course of instruction in physics; that he had begun the course, and was continuing it, upon the stipulated condition that he, who had free access to the library, should nightly bring him books of botany, which he himself would study late at night, so that they might be returned to the library shelves in the early morning before the household should be astir. Dr. Stobæus, suppressing the pleasure and approbation that were mingled with his amazement, said: "Go to bed, and hereafter sleep while other people are asleep." The next morning he sent for Linnæus to come to his study; asked him to rehearse again the story of how he obtained those books; then gave him a duplicate key to the library, together with permission to use it as freely as if it

were his own. Moreover, as he had hitherto nothing but his lodging with Stobæus, he was now invited to take his meals at his table; was often sent to visit patients, and in every way treated with affectionate regard.

When nearing the end of his year at Lund, Linnæus fell dangerously ill. At the beginning of a slow convalescence they sent him to the parental home, the parsonage at Stenbrohult. Here his admiring first patron, Dr. Rothman of Wexiö, visited him. He was now ambitious that his former pupil, instead of returning to Lund, should enter the great university at Upsala, where men of renown occupied professional chairs, Roberg in medicine, and Rudbeck the younger in botany. The parents, in view of the quite marvellous successes of their boy during the two years that they had left him without financial aid, seem to have relented, and partly forgiven his having disappointed their wishes as to a vocation; and he was given some money with which to procure conveyance to Upsala and make the beginnings of a career at that celebrated seat of learning; this, however, with the stern assurance that this was all they would be able to do; that no remittances from home would be forthcoming. Before the first year

at Upsala was completed Linnæus was penniless and almost barefooted; being obliged to line his shoes with birch bark and pasteboard, and his clothing was worse than threadbare. He was now in the twenty-third year of his age, and in his distress he still consoled himself with studies botanical. In the midst of the botanic garden at Upsala he sat, one autumn day, drawing up descriptions of some rare plants that were in bloom. An ecclesiastic of distinguished bearing in passing through the garden paused before him, asked him what he was describing, if he knew plants, was a student of botany, from what part of the country he had come, and how long he had been at the university, tested his knowledge of botany by asking him the name of all the plants that were in sight. This ecclesiastic was no less noted a personage than Olaus Celsius, a man then some sixty years of age, eminent as a theologian, an orientalist and more than an amateur in the natural sciences; even now beginning to be a botanist; for some two years before the date of his chance meeting with the student Linnæus he had been assigned by a council of Lutheran clergymen the task of writing a treatise on the plants mentioned in the Bible. His classic

Hierobotanon was the result of his attempt to fulfil that commission, and, by the way, none will ever know how largely he may have been indebted to the young student Linnæus in the preparation of that work. The examination that he had given the youth, there in the botanic garden, had filled him with wondering admiration. Celsius saw that he needed him; saw also in his worn clothing and almost bare feet the evidence of a worthy student's grinding poverty. Within a few days Linnæus was comfortably housed with Professor Celsius; having been commanded to bring with him that herbarium of 600 Swedish plants which he said had accumulated with the last three years.

Celsius was to write a botany of Palestine by and by, and was now devoting as much time as he might to the botany that was at hand, that of his own country; and he had augmented his great scholar's library by the acquisition of all the standard and many rare books of botany. Linnæus was again in the enjoyment of great good fortune. Yet all this was not for long. Celsius's very zeal and benevolence on his behalf brought the young man into trouble. By his great influence he procured for Linnæus an examination, which was followed by a license to lecture

publicly in the botanic garden. The candidate had not been three years in residence, and Professor Roberg expressed it as his opinion that the precedent was a dangerous one to have established. The lectures were begun, and Linnæus had a throng of students of the best class, among sons of some of the university professors; and he was now able to clothe himself comfortably. This all happened at a time when a promising instructor, Nils Rosén, had lately gone abroad on a two years' leave to obtain the doctorate in medicine. A less competent young man had been delegated to take Rosén's work during his absence. Linnæus, by his superior learning and personal magnetism, appears quite innocently to have drawn away his students. There would be trouble in store for Linnæus whensoever Rosén should return. It is a sad truth that, in science as elsewhere in this world, the mediocre man in higher position must hate and if possible persecute the superior man in lower station, and that for his very superiority, if for nothing else. Rosén, on his return from abroad, with the doctor's degree won, besought of old Professor Rudbeck permission to teach botany himself, hoping thereby to draw from docent

Linnæus all his students. Rudbeck declined to consider such a proposition, stating frankly that Dr. Rosén was hardly very well prepared to instruct in botany. Rosén's next move was successful. He procured the passage of an official regulation to the effect that no undergraduate should be permitted to lecture publicly, to the prejudice of a regularly appointed instructor. Such an instructor there was in the person of the young man who had been appointed to teach in Rosén's place while he was absent. Thus was Linnæus deprived of the means of living any longer at Upsala.

JOURNEY TO LAPLAND

Inasmuch as his lecturing in the botanic garden had been under Rudbeck's jurisdiction, and the latter had become much attached to the young man, he had taken him into his own household. Rudbeck himself had been the earliest botanical explorer of Lapland, and, by frequent rehearsal of the wonders he had seen in that wild hyperborean realm, he had enkindled in the young Linnæus a keen desire to go there. The Swedish government had long thought its own terri-

Carolus Linnaeus as he appeared when starting upon his
journey to Lapland in May, 1732.







torial possessions there to be worth investigating from scientific and economic points of view.

It was now soon arranged that Linnæus, under the auspices of the Academy of Sciences at Upsala, should make an expedition to Lapland for purposes of scientific exploration. He set forth from Upsala on the thirteenth of May, 1732, returning late in autumn. It had been a journey of some 2500 miles, made alone, for the most part, and almost everywhere on foot; but this was one of the most fruitful seasons of his whole life, though he was now but twenty-five years of age. His *Flora Lapponica*, together with the narrative of the journey, are among the most instructive and fascinating reports of a scientific expedition ever written. In the day when they were new they were unequalled in the literature of scientific travel; and the *Flora Lapponica* would have secured a deathless fame to any botanist, even if he had written nothing else.

JOURNEY TO GERMANY AND HOLLAND

After the return from Lapland the next two years were passed in teaching publicly

and privately, at one place and another in Sweden, mostly at Fahlun; but also at every spare hour of time working industriously at the manuscripts of several books—the *Flora Lapponica* and others—which he was all the while hoping soon to be able to give to the public. At Fahlun he won the esteem and friendship of the Rev. Johan Browallius, at that time private chaplain to a certain nobleman, subsequently a professor at the University of Abo, and Lutheran bishop of that diocese. This man urged Linnæus to circumvent his powerful antagonist at Upsala by going abroad and taking his degree in medicine at some foreign university. Following this counsel, Linnæus, in the beginning of the year 1735, sailed for Germany and the Netherlands, taking with him a finished medical thesis for presentation at some school of medicine, and also the manuscripts of several books of botany. Before the end of June he had passed the examinations, successfully defended his thesis, and obtained the degree of Doctor of Medicine; this at Hardewyk in Holland.

The primary object of his trip abroad having been attained, there were reasons why he might have been expected to take advantage

of the first opportunity that should present itself for his return to Sweden. Before leaving his native land Linnæus had acquired what is said to be easily gained by even a poor young man when he happens to be of good presence, polite accomplishments and some personal magnetism; he had provided himself with a rich and elderly prospective father-in-law. Said prospective father-in-law had returned the compliment by providing Linnæus with some travelling funds and the needful university fees. Before bidding the prospective son-in-law farewell Dr. Moræus, as if endowed with some of that wisdom that men say comes with years, and as if doubting that the prospective bride would surely speed the young man's early return, enjoined it upon him that he must come back and begin the practice of medicine whensoever he should have gained the doctorate.

But that which had long been uppermost in Linnæus's mind had been, not medicine, but systematic botany. In the direction of the latter all his ambition led him. The manuscripts of what he hoped would be immortal books of botany—and they became such—he had brought with him. No one in Sweden would have published them. In

Germany, in Holland and in France there were many and splendid botanical establishments and several learned botanical professors of world-wide fame. His books if published must have the approval of these in order to insure for them success. He must see these men, ingratiate himself with them personally, show them his manuscripts, discuss with them the merits of his system; for it was new, and in its leading characteristics altogether revolutionary. His money was now almost all gone, but what of that? He had often been in such straits before, but some provision had always hitherto been made for him.

Leyden was the seat of what, at the time, was the most celebrated university in Holland; and, for botanical gardens, and botanical celebrities who had taught there, was hardly second to Paris itself with its traditions of Tournefort and his successor, Vaillant. In Professor Paul Hermann's time, little more than a generation anterior to Linnæus, the Leyden Garden had been confessedly the finest and richest in the world. After Paul Hermann, Dr. Hermann Boerhaave had presided there. He had retired from the professorship three years before Linnæus's arrival

in Holland, and was now at once the most famous physician in Europe and without a rival as an authority upon systematic botany. He was living in age and retirement not far from Leyden, and there was not another man upon the face of the earth whom Linnæus so much wished to see. He could not endure the thought of returning to Sweden without having visited this great Mecca of botanists, Leyden. Once there, he found friends in learned botanists nearer his own age who had not yet published books, and of whom he had not heard. Among these, Adrian van Royen, professor at the University in succession to the illustrious Boerhaave; also Dr. Gronovius, a well-versed and ardent botanist. Others at Leyden who became Linnæus's cordial and helpful friends we must not stop to name. Both van Royen and Gronovius became enthusiastic over the young man and his manuscripts. Gronovius was so charmed with his *Systema Naturæ* that he proposed, with Linnæus's permission, to have it published at once, and the printing of it was begun. It came out, as a mere outline sketch of a new natural history. It was a folio tract of but fourteen pages, but it was everywhere received with the greatest applause.

Meanwhile, Linnæus had used every endeavor to see that great oracle of medicine and of botany, old Boerhaave, but in vain. Provided with a letter from Gronovius, he had called every day for a whole week, but to no purpose. Ambassadors and princes had found him accessible with some difficulty. Even Peter the Great of Russia had been obliged to wait two hours in an ante-room, to take his turn in getting a conference with this busiest and most imperious old prince of learning and master of the healing art. Linnæus now bethought himself to send a copy of the new *Systema Naturæ*. A letter came back, naming the day and the hour when he should be admitted to an audience. The interview was prolonged and was carried into Boerhaave's own private botanic garden, a place well stocked with almost all plants and trees that had been found to endure the climate of Leyden. One beautiful tree which Boerhaave thought—was even very certain—had never been described, Linnæus gave him the name for, also the volume and page of one of Vaillant's folios in which it was described fully and clearly. When they returned to the library the place was found and the truth was admitted. The venerable doctor

advised the young Swede to settle in Holland, where he felt certain that his learning and talents would insure him wealth and great renown. But since Linnæus could not now prolong his stay at Leyden, Boerhaave desired him to take a letter from himself to his friend, Professor Burmann, at Amsterdam, the port whence Linnæus had proposed to sail for Sweden. He found Burmann, then much engaged upon his Botany of Ceylon,¹ so overwhelmed with work of several kinds, that courtesy seemed to require that he should make the call short. It was evident that nothing but the letter from that great scientific potentate Boerhaave, at Leyden, had procured him admission to Burmann's presence. On withdrawing, however, he was invited to call again. At the second call he found the Amsterdam professor less preoccupied. They went into the botanic garden. At the end of this interview Burmann was overwhelmed with a sense of the unexampled skill of this young Swede in botany. He had learned so much of him in that one hour as to see that he must secure, if possible, his help in the finishing of his great book of

¹ *Thesaurus Zeylanicus*, 4to, 1737.

Ceylonese botany. Linnæus was invited to take up his abode with Burmann for the period of his sojourn in Amsterdam, and he accepted the bidding. He had been there about two months when he received a call from one of the merchant princes of Amsterdam, George Clifort. He was a gentleman of culture as well as of great wealth, and had a very noble garden and conservatories abounding in rare plants from the Indies and other remote places. But his errand with Linnæus was not botanical. He was something of an invalid and melancholy. His regular physician was Boerhaave, at Leyden. On a late visit to him, Boerhaave had advised him that his ailments were chiefly resultant from his princely ways of living; that he could not do better than employ the services of a brilliant young Swedish physician, a specialist in dietetics, at present the guest of Professor Burmann. He advised him to take Doctor Linnæus for body physician into his own house, and place himself under his direction as to diet. This was Clifort's motive in calling upon Linnæus. The outcome of it was an agreement between them; and the young physician botanist was soon quite luxuriously domiciled with Clifort, and under

good pay. Charmed with the Cliffortian garden and conservatories, and seeing there many a plant unknown to botanists, Linnæus counselled the preparation and publication of an illustrated folio, that might fitly be entitled the *Hortus Cliffortianus*, in which the rarities and novelties growing there should be brought to the knowledge of the world botanical. Of course the proposition delighted Cliffort and the work was done. That most luxurious of all Linnæus's works, the *Hortus Cliffortianus*, he assures us, was written in nine months. It was published in Amsterdam in 1737, when Linnæus was thirty years old. But besides this, there had already been published, since Linnæus had come to Amsterdam, the *Bibliotheca Botanica* and the *Fundamenta Botanica*, in the year 1736; and there now followed the *Flora Lapponica*, the *Genera Plantarum* and the *Critica Botanica*, all in the year 1737; some of them issued at Amsterdam, others at Leyden. This represents the most wonderful beginning at botanical authorship of which there is any record. Here were seven learned and forceful books, two in folio and five in octavo, all given to the public within two years, almost a library of botany, and that a new botany, and so

easy to comprehend, that almost any educated person could now acquire proficiency in botany by these books alone as a guide. The system was a new one; evidently a rival system to that of Tournefort, which had now been dominant for forty years. All the botanical world was in amazement; and the author, having now been three years abroad, and having made his personal impression upon nearly all the botanists of London and of Paris, as well as upon those of Germany and Holland, went home to Sweden, there at first to suffer the adverse consequences of fame, and afterwards to enjoy its benefits.

PRACTISES MEDICINE IN STOCKHOLM

To suffer, I say, the consequences of renown; for Linnæus had now to realize the truthfulness of what was said by the Great Master of long ago, namely, that "a prophet is not without honor, save in his own country, and in his own house." At the University of Upsala now, as aforetime, there was no hope of preferment for Linnæus. His books did not as yet bring him income. He must settle down to the practice of medicine, and

he chose Stockholm, the capital, and chief city of the kingdom. There he was a stranger. There was not one friend to recommend him; and, as he himself records it, no one would employ him, even by committing a sick servant to his care. His system of botany began also to be assailed in public vigorously and tellingly. Just across that arm of the sea that separates between Sweden and Russia, at St. Petersburg Professor Siegesbeck had written and distributed a book in which the Linnæan system of botany was arraigned severely, and with so much point that many people in Sweden thought that Linnæus had been philosophically and botanically annihilated.¹ He admits

¹ Referring to the attack of Siegesbeck Linnæus, wrote thus from Hartecamp to his friend Haller: "This author has been very hard upon me. I wish he had written these things when I was first about publishing. I might have learned when young, what I am forced to learn at a more advanced age, to abstain from writing, to observe others, and to hold my tongue. What a fool I have been to waste so much time, to spend my days and nights in a study which yields no better fruit, and makes me the laughing-stock of all the world! His arguments are nothing; but his book is filled with exclamations such as I never before met with. Whether I answer him or keep silence, my reputation must suffer. He cannot understand argument. He denies the sexes of plants. He charges my system with indelicacy; and yet I have not written more about the polygamy of plants than Swammerdam has about bees. He laughs at my characters,

that he almost believed that himself; and, as now the tide had set strongly in his favor as a medical practitioner at Stockholm, he had resolved to abandon forever the service of Flora and devote himself wholly to that of Æsculapius. And the tide of Linnæus's fortune in medicine rose higher. One and another of the nobility became numbered among his patients, and at last, the queen herself; and now, as he said in a letter to a friend, no one who was ill could get well it seemed, without his help.

On September 15, 1739, he thus writes to Haller from Stockholm: "I began to get money, and was busy in attendance on the sick, from four in the morning till late in the evening; nor were my nights uninterrupted by the calls of my patients. Aha! said I, Æsculapius is the giver of all good things; Flora bestows nothing

and calls upon all the world to say if anybody understands them. I am said to be ignorant of scientific terms. He judges me by the principles of Rivinus, and hundreds of the vilest scribblers. Inasmuch as this man humbles me, so do you, whose learning and sense have been made sufficiently evident, exalt me. It distresses me to read the commendations you are pleased to heap upon so unworthy an object. I wish there might ever be any reason to expect that I could evince my gratitude and regard for you. I hope life will be granted me, to give some proof of my not being quite unworthy."

upon me but Siegesbecks! I took my leave of Flora, condemned my too-numerous observations a thousand times over to eternal oblivion, and swore never to give any answer to Siegesbeck."

APPOINTED PROFESSOR AT UPSALA

Court influence now procured him the comfortable position of Physician to the Admiralty. After that the death of Dr. Roberg, professor of medicine at Upsala, opened the way to Linnæus's promotion to a professorship at that university. It was that of medicine, and that of botany was, at the time, held by Linnæus's former antagonist Rosén. The two professors, now equal in official rank, became reconciled and, with the full consent of the authorities, exchanged professorships. Linnæus was now again a botanist. He was still a young man, only some thirty-four years of age, and had lived out not quite half his days. The after years, those of fruition, did not produce as much of importance to botany as the earlier period had yielded. There came out in 1751 the *Philosophia Botanica*, partly of the nature of a recension and enlargement of two of his

early books, the *Fundamenta Botanica* and the *Critica Botanica*. It is one of his most important and imperishable books. In 1753 appeared the largest and most comprehensive of his works, the *Species Plantarum*. During the remaining years of his life Linnæus was largely occupied with the preparation of new editions of almost all his works, the public demand for which was very great.

INFLUENCE OF LINNÆUS UPON BOTANY

It is not possible to convey an idea of what Linnæus accomplished for the advancement of botany without presenting, in brief outline, a view of what had been done before him. That there was not much botany before Linnæus is a fable that gained popular credence in rural districts a half century ago. One of the earliest books which our Linnæus published was the *Bibliotheca Botanica*. It contains the titles of 1000 volumes, by almost as many different botanists, most of which books he thought an indispensable part of a working botanist's equipment; and his own works, on almost every page, abound in citations of those of his predecessors. The first foun-

dations of scientific botany had been laid by Cæsalpino, an Italian physician and university professor of botany, 124 years before Linnæus was born. He selected his granite blocks of principle so well, and laid them so securely, that the superstructure of modern systematic botany rests upon them. Every variation of botanical system that has been builded in the last 324 years has rested on the Cæsalpinian foundation, *i. e.*, that in the fruit and seed of plants we have the key to their affinities. Not one of the great geniuses botanical in later times who have most advanced the science has questioned the validity of that principle. Not one has yet dared to predict that the Cæsalpinian foundations are likely ever to be abandoned as insecure.

The earlier disciples of Cæsalpino made many amendments and signal improvements of his system, through further study of floral structure, as furnishing yet other clews to plant affinities. The summing up of these many improvements was made by Tournefort, whose *Elements of Botany*, published in 1694, 111 years after Cæsalpino's great work, and thirteen years before the birth of Linnæus, took the whole botanical world captive, and held undisputed sway, until everywhere but

in France, the native land of Tournefort, they were superseded by the system of Linnæus.

To the botanists present who are unread in the history of our science, nothing will be more surprising than the information that, with the great Tournefort, who founded upon the flower the most universally approved system of botany which up to that time had been presented, the flower was hardly anything more than we know as the corolla. Of the functions of stamens, stigmas and styles he was ignorant, confessed his ignorance, and regarded them as wholly insignificant things, hardly to be seriously taken note of. The flower and the corolla were with him almost synonymous; and yet so uncertain was he in his identification of the corolla that where, as in all the Araceæ, it is absent he took the spathe for the corolla; while in such apetalous things as the castor bean, he regarded the brightly colored stigmas as the corolla. Such extremely crude ideas of floral structure were those of Tournefort to the end of his career; and he died when the infant Linnæus was one and one half years old.

Now the Linnæan doctrine of the flower and that of Tournefort represent opposite

extremes. To be more specific: while Tournefort's conception of the flower as an organism is about as crude and imperfect as can well be imagined, that of Linnæus is almost perfect. In the view of the former the one important organ is the corolla, the stamens and stigmas nothing, or next to nothing; according to Linnæus, the stamens and stigmas with the ovary, are the only essential organs of the flower, the corolla relatively unimportant. All the world botanical now understands that the philosophy of floral structure upheld and most effectively promulgated by Linnæus was the right one. The actual discovery and demonstration of this new and revolutionary anthology are not attributable to Linnæus. In the year that the small boy Linnæus left home for the Latin school at Wexiö a new incumbent was installed into that professorial chair at Paris which Tournefort had occupied. The new professor had been one of the pupils of that celebrity. His name was Sebastian Vaillant. The subject of his inaugural address was the Structure of Flowers. In this address, soon afterwards printed, Tournefort's anthology was completely undermined, and what was offered in the place of it became the accepted anthology

of the remaining 80 years of the eighteenth century, of the whole of the nineteenth, and is thus far that of the twentieth. In other phrase, that doctrine of the organization and the functions of the flower which Vaillant set forth as new in the year 1717, has held undisputed sway, without significant augmentation or amendment, for now 190 years. Every botanist will readily perceive that this is a very rare encomium. Every one will realize that to very few can it have been given to lay down the fundamentals of plant taxonomy. Those fundamentals, as we have all been taught, and as our forefathers were taught, are really only two, namely, carpology and anthology. Cæsalpino in the year 1583 established the true carpology. Vaillant in 1717, the true anthology. These were the two great things to be done before there could be a true and philosophic system of botanical classification. Now which of these two names is the greater in scientific botany may be open to learned dispute; but so long as the accepted foundations of botany remain in place, successful competitors for their exalted rank there can be none.

Five years after having published this masterpiece of plant organography Vaillant died.

His death occurred on his fifty-third birthday. He also died unthanked for the greatest of several great things that he had done for botany. All the world botanical still idolized the memory of the great and popular Tournefort; and it resented that virtual overthrow of his whole system which this remarkable former student of his had accomplished. Universally, and bitterly they charged him with ingratitude. And so that inaugural address, in which this far greater man than Tournefort had given to his science the very best that was in him, became an offense to the blind invidious multitude. When they should have praised him, they blamed him; and he lay down and died.

But afar in the north, in the land of giants mythical and giants real, there was an ungigantic youth of great mind and of noble soul, who would champion most successfully the cause of Sebastian Vaillant; and in so doing create a new system of botany that should supersede that of Tournefort.

It was in the year 1729, when Linnæus was in his twenty-third year, and a student at Upsala, that he first became acquainted with Vaillant's great tract; learning from it that those obscure and long-neglected stamens

and pistils were sexual organs and the only really important parts of any flower. This being true, it was plain to him, as it had been to Vaillant, that Tournefort's classes of plants established upon the corolla as the essential organ were unphilosophically and untenably based, and must fall. From that day Linnæus determined to work out a new system of classes and orders of plants, on the basis of stamens and pistils as the most important floral organs. The result was 24 classes of plants established upon characteristics of the stamens, instead of the 22 classes of Tournefort distinguished by differences in the structure of the corolla. The Linnæan classes were very much more easily learned than the Tournefortian. His Class I embraced all genera of plants the flowers of which have but a single stamen; Class II, those which have two stamens, and so on up to Class X, when other considerations, still in part numerical, were seized upon. Any mere beginner in botany, with a plant in flower before him, could determine its class without even opening the book. If the flower exhibited five stamens the plant was sure to belong to some genus of Linnæus's Class V. If the same flower showed also two pistils, that indicated as unmistakably Order 2

of Class V. No other system of plant classification ever invented made the beginnings of botany so easy; no other ever was so immensely popular. But what is much more to the credit of the Linnæan classes and orders than the popular applause with which they once were hailed is the fact that the determination of plants under them necessitated close inspection of all, even the minutest and obscurest parts of every floral structure; trusting that in these minute, obscure and hitherto neglected organs there would be found some of the very best indexes of affinity. This line of investigation, so important to all taxonomy, Linnæus was the very first to carry into practice and make universal. It will be difficult to bring the average botanist of to-day to a realization of how great an epoch in botany Linnæus created when he began examining the stamens of every plant, with the purpose of ascertaining into what one of his 24 proposed classes of flowering plants each generic type must fall. And though it be true that the classes and orders of Linnæus fell into disuse three-quarters of a century ago, it is true to-day that every botanist, from the mere beginner in taxonomy to the most accomplished master of it, if he have a new and unknown

plant in hand for determination, makes his final appeal to stamens and pistils. These, by peculiarities of structure, will tell the plant's relationship in many an instance, both promptly and decisively. In this procedure, every botanist who lives is distinctly a disciple of Linnæus; for he, putting Vaillant's principles into taxonomic practice, first inaugurated the method, and eventually brought to pass its universal recognition and its permanent establishment. When in the year 1735, with those manuscripts of his new botanical system, Linnæus went to Germany and Holland, he had now for seven years been scrutinizing carefully and industriously the stamens of everything that had come to hand. By dint of those seven years of industrious investigation of these organs he had not only become very expert in this line, but he was the only man in the world who knew anything about the morphology of stamens. He was now to the oldest and most experienced systematists of Europe a perfect marvel on account of the readiness with which he could solve for them some of their most perplexing taxonomic puzzles. I can not stop to cite more than a single instance. In one of the larger Dutch herbaria there was a rare specimen

of the leaves and flowers of a certain oriental tree. The bark of this kind of tree had been known in Europe as a commercial importation for I think some 2000 years. They called it cinnamon. As a generic type the tree had been named in Latin *Cinnamomum*. The professor gave Linnæus the information that these were the leaves and flowers of the cinnamon tree; but what were the natural affinities of the tree? Had it consanguinity with any other known tree? To what was it related? These were questions which not the most expert botanists could answer. The fruit of the tree was not yet known, and therefore could not be appealed to. The flowers were small and insignificant. Linnæus took one of those small dried-up flowers, subjected it to moisture, so that he could get a view of the anthers without breaking them, then, looking at these alone, was able to answer, with the most perfect assurance, that this cinnamon tree is a very near relative of the familiar sweet bay of southern Europe, a species of the genus *Laurus*. The man's frequent solving of enigmas like this, in the presence of the most learned and capable botanists of the world, brought it to pass that he was spoken of everywhere among the Germans and Flemish as the

little oracle; for when he gave a decision about the affinity of any imperfectly known plant, he was admitted to be correct. It was as if an oracle had spoken. These brilliant pronouncements must also have prepared the way for that great success which his publications met with, and that ready adoption of his new system which followed almost everywhere despite its character as radical and revolutionary.

If, then, Linnæus, at the time when he began publishing the fundamentals of his new system occupied a place wholly unique among botanists then living as to knowledge and understanding of floral structures of all kinds, so that the oldest and ablest among them stood in speechless admiration of his superlative attainments, there was forthwith exerted by him a most salutary influence upon the important part of plant description. The revolution which he at once brought about in the art of generic diagnosis was perhaps the most priceless of his several strong contributions to phytography. In his *Genera Plantarum* of the year 1737, every genus is so well characterized in words, that plates and figures illustrating them are not needed. The group which Linnæus takes for a genus is

even more clearly defined by his few descriptive sentences than is a genus of Tournefort, in which the defects of its description are eked out by a fine quarto plate representing the type. And the reason why Linnæus surpassed immeasurably every author who had preceded him in the practice of generic diagnosis was that he had all their understanding and appreciation of calyx, corolla and fruit, and added to that his mastery of stamens, stigmas and styles, the very names of which were unknown to the generations that had preceded him, and hardly yet known to the most celebrated of his contemporaries. In the later editions of the *Genera Plantarum* no improvement is to be noted in his diagnoses. They were models as he gave them out at first, at least as viewed from the standpoint of Linnæus's acknowledged greater master, Cæsalpino. They are still essentially the models of generic diagnosis with all who still hold the Cæsalpinian doctrine that flower and fruit are to supply the only recognized data for the establishment of classes and genera of plants. Even George Bentham, who lived more than a century after the time of Linnæus, and was the supreme master of generic diagnosis that the nineteenth century knew, was

strictly a Linnæan in this regard; so that here, as at many another important point in the most recent botany, the genius of the great Linnæus rules and directs.

Fellow members of the Botanical Society of Washington, if this had been a meeting of our own, and not that of two other learned societies in joint session with us, I should have preferred, as I said at the beginning, to discuss some one of Linnæus's greater books; taking it as a text from which to set forth his deeds; his many benefactions to our science. To some it will doubtless appear anomalous that here not so much as the briefest abstract of his various reforms in nomenclature should be given; especially since, in the minds of so many botanists of recent decades, those reforms are thought to be the most important service that Linnæus rendered to botany. Several of the most commonly received opinions about him as nomenclator are absolutely groundless. Several principles of nomenclature now almost everywhere approved were under his severest reprehension. Inasmuch as I myself was the prime mover in the direction of what has now come to be well known abroad as the Neo-American school of nomenclature, I may be permitted

to say that during more than twenty years past I have steadily and unwaveringly been of the opinion that to attempt to legislate upon nomenclature is but futility, if not folly, until every participant in every nomenclatorial conclave shall have familiarized himself with all that Linnæus said, and said with such commanding authority, upon this subject. So, then, the discussion of Linnæus as nomenclator, at least in my understanding and appreciation of him, could not alone be done within the time allotted us to-night. To omit it altogether was imperative.

The same limitations have precluded my calling attention even briefly to Linnæus as evolutionist, as ecologist, as medical botanist, or as one who contributed much to the advancement of what is now commonly spoken of as applied botany in general.

Of the real merits of Linnæus they know little who, observing that his classes and orders are become obsolete, and that neither his idea of a genus is that of more recent botany, nor his conception of a species, conclude that his figure must by and by grow dim on the horizon of botanical history. I say, they who know little of his real merits may give place to such forebodings. But they

who fully realize what he accomplished in so many different directions to the great and lasting advantage of our science will be rather disposed to wish that an equal of Linnæus might soon be born; and might think it well that the natal day of the matchless Swede should be held sacred not only once in each century, but a hundred times in every hundred years.

❁ LINNÆUS AS A ZOÖLOGIST ❁



IEWED in a broad way, the services of Linnæus to zoölogy were of several kinds.

The first and greatest, though at the time of its conception regarded as relatively unimportant, was the invention of what has long been known as the binomial or Linnæan system of nomenclature. The conception of a permanent name for each type of organized beings, thereby giving to the naturalist a concise method of indicating each unit of the system, was so great an advance on any previous method of handling zoölogical species that it amounted to a complete revolution in methods; comparable to that for the arithmetical sciences, which followed the adoption of the decimal Arabic symbols in place of the clumsy Roman notation of numerals.

That previous zoölogists, like Rumphius, had more or less inadvertently approximated to this system at times, while giving names to animals, does not diminish the credit due to Linnæus for erecting the method into a

¹ This section has been contributed by Dr. William H. Dall.

definite system emphasizing the principles of permanency and priority, and elaborating its details.

The second service was that of holding up the animated creation as an interrelated whole. This grasp of the subject would be impossible to a naturalist of the present day were the multitudinous units of the animal kingdom now known presented to him in the chaotic state in which Linnæus found the little microcosm which he had to deal with. The progress, by the Linnæan methods, since his time, has been so great; anatomical, ecological and embryological discoveries have so illuminated the subject; that we are prone to look with amusement on the crude classification which alone in his time was possible, without appreciating the instances it contains of really astonishing insight into the true relation of organized beings.

It is only when we compare the Linnæan classification with the contemporaneous absurdities of such antagonists as Jacobus Theodorus Klein, who in bewigged pomposity stares at us from the frontispiece of his ridiculous "Tentamen," that we can appreciate the quality of the genius of the immortal Swede.

A third manner, and by no means the

least important, in which Linnæus influenced zoölogical science, was through his friends, associates and pupils. We all know what the personal influence of Louis Agassiz did for science in America. Something of the same sort emanated from the personality of Linnæus in his time.

In the days of his early struggles it must have been evident, or we should not read of how such men as Rothman, Stobæus, Celsius, Rudbeck and Reuterholm exerted themselves to promote the fortunes and facilitate the studies of the poor country parson's son. A little later, as he began to win a footing, we find the greater scientists with whom he was brought in contact giving him a cordial welcome; and, from men like Gronovius, Boerhaave, Burmann, van Royer and Clifford in Holland, Artedi in Sweden, Jussieu in France; Haller in Germany and Dillenius in England, such recognition was no feeble testimony to his influence and worth. Still more conclusive are the relations to Linnæus of such ornaments of the nobility as Counts Tessin and Gyllenborg, and her Majesty Queen Ulrica, worthy precursors of the liberal-minded nobles of to-day, and their leader, His Majesty of Sweden, always foremost in

promoting science, exploration and the arts, to the true glory of his kingdom.

From every civilized nation, as well as from Sweden, Linnæus drew pupils. Those conversant with the dawn of science in the modern sense, will find familiar the names upon the roll.

First, as true martyrs of science, who gave their lives, by pestilence or accident in foreign lands for the promotion of discovery, are Ternstrom who died in China; Hasselquist in Smyrna; Forskal in Arabia; Loeffling in South America; and Falk in Tartary.

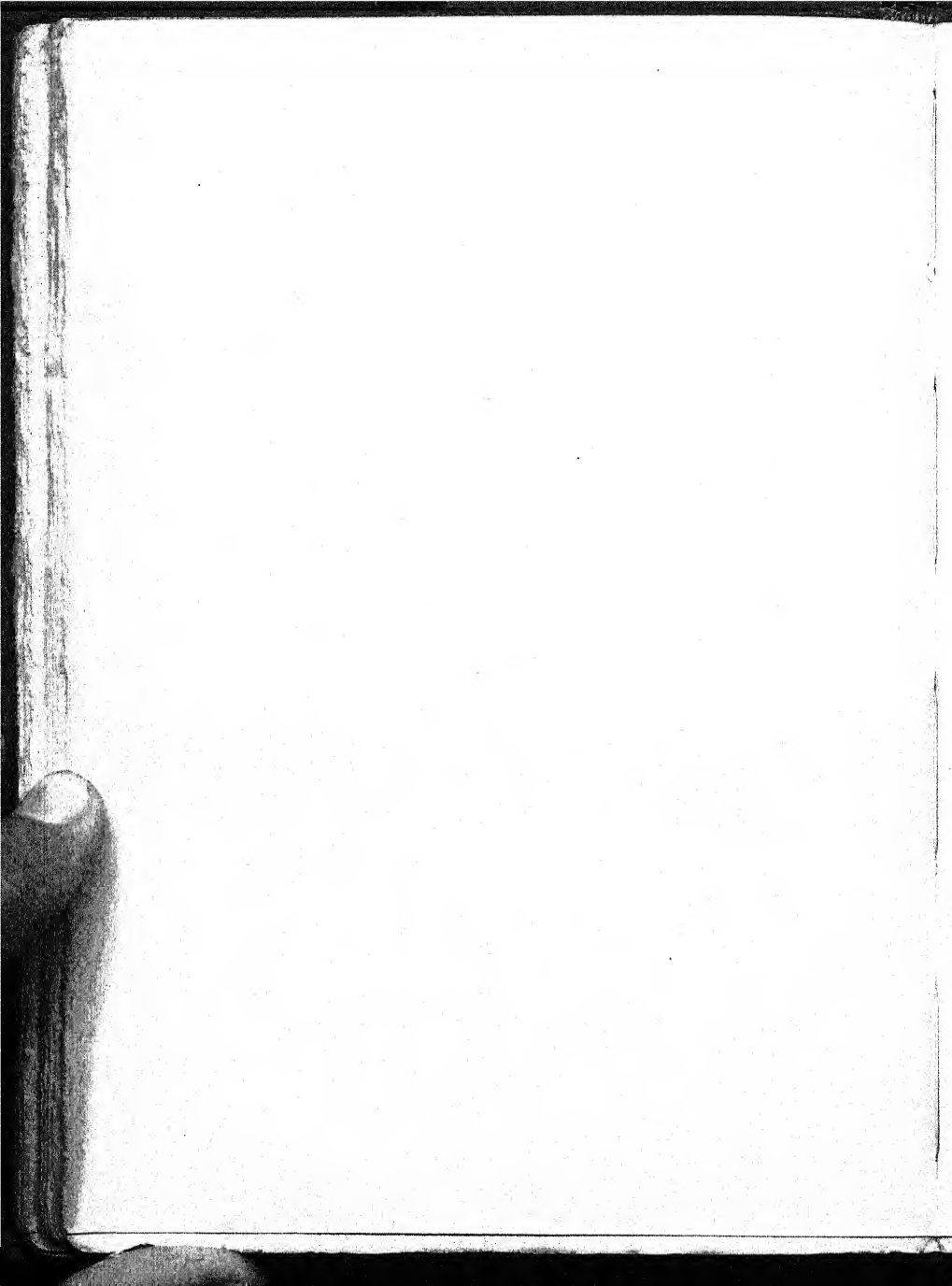
Those more fortunate, but not less daring, who adventured in foreign lands and by a safe return were enabled to reap, in their lifetimes, a reward of merit, were Peter Kalm in North America; Rolander in Surinam; Toren in Malabar; Osbeck in China; Sparrmann in South Africa; Thunberg in eastern Asia and Japan; Niebuhr in Egypt; Gmelin in Siberia; and, in various parts of Europe, Koehler, Alstroemer, von Troil, Fabricius, and Solander.

I have mentioned but a prominent few among many. A little leaven leaveneth the whole lump. That influence which drew and held students, which inspired them to their utmost efforts, faithful in the quest

of knowledge even unto death; which helped to mould a second generation to carry on the work of research; which affected more or less deeply every student of nature in the last quarter of the eighteenth century, and has not yet spent all its force; that influence was no trifling gift to mankind.

The details of work accomplished by Linnæus, as by each and every one of his successors, fluctuate in value under the keener scrutiny and more refined methods of those who follow after. The fate of theories lies in the lap of the Gods.

But the spirit which inspired them; the ardor which hands on the torch as the runner sinks exhausted by the way; the devotion to truth and disregard of self imparted by a great teacher; and which shall endure while a human mind and heart exist to cherish them—these are gifts immortal.



LINNÆUS AS AN EVOLUTIONIST



NOT more than two decades have passed since with most people who had interested themselves in such matters, and with quite all who had not, evolutionistic theory and Darwinism were synonymous; the supposition being that Charles Darwin had been the original inventor, as well as the strong promulgator, of the hypothesis of the descent of present-time species of living things from earlier types. That misunderstanding nowhere now prevails; and while a multitude of talkers and writers on all sorts of topics use freely the term evolution, Darwinism is less frequently mentioned; for it is coming to be realized somewhat generally that there were "Darwinians" not a few, not only before the Darwin of the nineteenth century, but even before that almost as remarkable grand-sire Darwin of the eighteenth. There were evolutionists among the Greeks of five and twenty centuries ago, and even among the earliest luminaries of Christian philosophy and theology of a period only less remote; while after the revival of learning, and of an interest

in nature study, evolutionistic ideas found expression not infrequently; and of late, historians of science are bringing all this to light.

The catalogue of more or less distinctly evolutionistic naturalists who lived before the end of the eighteenth century, and who gave some expression to their ideas on this topic, is not a short one; but the name of Linnæus has not, in so far as I can learn, been placed on that list hitherto, except very hypothetically.¹

For any possible expression of views as to the origins of groups of plants and the permanency or mutability of such groups, one would naturally look, not to his many volumes of taxonomic and descriptive writings, but to just such a work as the *Philosophia Botanica*. Yet there one looks in vain for any expression that is not positively and unmistakably contrary to the idea of evolution.

In respect to the origin of genera, that which he says—and with Aristotelian brevity and conciseness—is this: “Every genus is natural and was in the beginning of things created

¹ In the environment of the idea of evolution Linnæus may be considered not as a positive but as one of the negative factors.—Osborn, *From the Greeks to Darwin*, p. 128.

such." And because of this—which might well enough be called the supernatural rather than the natural origin of genera—because of this origin, he argues that: "No one genus is ruthlessly to be divided and treated as if there were two; neither are any two or more to be put together as if constituting only one."

In the light of such a pronouncement one could not attribute to Linnæus any notion of the gradual evolution of such groups of species as constitute genera; and if a genus is to have such origin, so, by the necessities of logic, are species also made; and he says: "All species are certain diversities of form which the Infinite Being created so in the beginning; which forms, according to immutable laws of generation, produce always their like." From this he proceeds to establish more firmly, if possible, the immutability of species by defining generation as being the actual "continuation of the species;" and he concludes by calling attention to how, as by necessity, this origin of all species precludes the possibility of any new species ever arising. And thus under the heading of species does our author seem to have builded even a more insurmountable wall against the possibility of

one's successfully claiming him for the camp of the evolutionists.

There remains one other category of plant forms, of lower rank than species, recognized by Linnæus, that of varieties. Unless I err, he claimed that he had been the first of systematists to recognize varieties and to teach the distinctions between variety and species. Will he so define variety as to leave an opening for the possible development of a species out of that which started forth at first as a mere variety? If we use our own reason, and credit Linnæus with not momentarily forgetting to use his, we may not look to see him contradict himself quite so promptly. He has said, and that in the paragraph next preceding the definition of variety, that all species—not most of them but all of them—were constituted such by the Creator in the very beginning of the existence of plant life and form. He will not subvert this proposition; at least, not in the very next sentence. His notion of a variety is, that it is such alteration of a species as may have been induced by changed conditions of climates, soil, temperature, exposure to or shelter from high winds or any such items of mere environment; and he does not fail to add that, on

the restoration of the plant to its old environment, it reverts to the original type form. One sees at a glance that this is not our twentieth century idea of a botanical variety; but it is the Linnæan idea, and with that alone we are here concerned. The man makes so small account of varieties, from the taxonomic point of view, that he concludes his discussion of the topic with an apology for giving them place and mention in his books of systematic botany. "Variation," he says, "is in such matters as the size of the plant, doubleness of flower, a crisped or curled foliage, a difference of color, odor, flavor, etc." But he adds: "Many varieties of plants are in favor with gardeners, and agriculturists, others with florists, while still others are in esteem with pharmacists." From these expressions it is plain that Linnæus did not consider these changeable and even transient forms worthy of any serious consideration by botanists proper, and admitted them to his books only as in condescension to the wants of those classes of tradespeople whom he mentions. It may here be added that in almost all more recent botany, varieties such as Linnæus had in mind when he wrote the definition find no place. One looks for

the account of them, if anywhere, in the calendars and catalogues of gardeners, pomologists, nurserymen and florists.

I have long understood how very definitely and absolutely this fine book, the *Philosophia Botanica*, excludes every idea of a possibly evolutionary origin for any species of plant.

And yet, Linnæus was an evolutionist. Nor is this so passing strange in a world where men in great numbers—even some of high standing and great ability—say one thing and think the very opposite.

That he entertained doubts as to the truthfulness of the proposition that everything that ought to be called a species had been made as it is in the beginning, is a discovery that I made quite fortuitously. In the study of some species of *Thalictrum* I had need to consult a certain page of the *Species Plantarum*. Reading his account of *T. flavum*, and next below it that of *T. lucidum*, his concluding note regarding the species last named quite startled me. His Latin sentence here, as in many another place, is highly figurative, quite after the style of many a classic rhetorician and poet; and I read it again, and very carefully, to see if the idea which the first reading conveyed to my mind

was quite that which the author meant to convey. There could be no doubt. Putting it into plain English prose; making it read as one would now write the same thought, his note on *Thalictrum lucidum* is this: "The plant is possibly not so very distinct from *T. flavum*. It seems to me to be the product of its environment."

As helping toward a full understanding of this pregnant remark it must be said that the species *flavum* inhabits the cool moist meadows of northern Europe, while *lucidum* belongs to southern France and to Spain. Each has then decidedly its own environment. Each was known to be equally established as a permanent and indigenous plant form. Linnæus's reason for naming *flavum* as the parent and *lucidum* as the offspring was a reason no better than this: *T. flavum* was of his own northern country and he knew it well. *T. lucidum* was a southerner, and he was less familiar with it; probably had never seen it but in a northern garden. That was all. It was a thing far enough from being amenable to his definition of a variety. It seemed a species; yet he doubted that it was any more than a daughter species to *Thalictrum flavum*. The one had been created a

species in the beginning, the other was probably not so old; more likely to have come into existence away down among the more arid hills of Spain; but it had come to stay. Rather many plant forms that had been reckoned good species before Linnæus and that are now again so considered everywhere today, were with Linnæus mere varieties of other species. But he declined so to treat *Thalictrum lucidum*. If the relation between this denizen of the fervid South and his plant of the frigid Scandinavian peninsula should be declared nothing more than the relation between a specific type and its variation, botanists would be asking how long before he would make an end of species altogether. He was not himself convinced that it was a mere variety, and so he retains it as a probable species, yet to his half secret thinking not as first created such, but the descendant of another species.

Familiar as I had been for many years with the *Species Plantarum* as a book of reference, this one discovery upon which I had now stumbled, seemed so much like a new revelation of the mind of Linnæus that within a very few days I had read every one of the 1682 pages of the edition of the year 1764 in search

of other kindred expressions regarding the possibility of the descent of some species from others.

Only three pages away from the record of his thought about the origin of the *Thalictrum*, under *Clematis maritima* occurs this remark: "Magnol and also Ray have adjudged this to be a variety of *C. flammula*. I should rather think it is derived from *C. recta* under altered conditions." Now while this remark, standing by itself, might indicate an opinion that the plant under discussion was a mere variety of *Clematis recta*, yet Linnæus did not so place it in this or any other of his books. He gives it the rank of a species, distinctly, and must needs have done so in view of his own definition of varieties as transient forms, developed mostly under cultivation. *Clematis maritima*, as its name indicates, is a seaside species, unchanged in its character from immemorial ages. He knew all this and held it to be not a variety but a derivative species; not one so created in the beginning.

Again, next to the familiar *Achillæa ptarmica*, of almost all Europe, he places the name and description of *Achillæa alpina* known only from the mountains of Siberia. No botanical

authority has ever seemed to think of this as possibly a mere variety of *A. ptarmica* of Europe; no more does Linnæus; but while according it full specific rank, and as if forgetful of all he had said in the *Philosophia Botanica* upon such matters, he appends to his technical account of *A. alpina* this most evolutionistic suggestion: "May not the Siberian mountain soil and climate have moulded this out of *A. ptarmica*?"¹

Among the more elegant flowering plants adorning the borders of subsaline marshes southward in the United States is one which Linnæus denominated *Hibiscus virginicus*.² It is exclusively North American, and even here of somewhat restricted range. A similar species, of distribution as limited and peculiar, belongs to southern Europe, inhabiting the shores of the Adriatic Sea. Now between these two kinds of *Kosteletzkya* occupying widely sundered continents, and neither one much more than local, each along its own little line of seaboard—between these two Linnæus apprehends the existence of a more intimate relationship than the most advanced

¹ An locus potuerat ex præcedenti formasse hanc? Species Plantarum, 2 ed., p. 1266.

² *Kosteletzkya virginica* of more recent authors.

evolutionists of the twentieth century would be likely to affirm. He remarks a very close superficial likeness between them; so close that, were that all, he would declare them to be specifically one and the same; but, in the characters of their little seed pods or capsules they are so unlike that on this account separate specific rank must be accorded both, and so he places them; concluding, however, with this thoroughly evolutionistic query: "May not the Venetian species have sprung from the Virginian?"¹ The more probable theory of the evolutionist of our time would be, that both are descendants from some common ancestor that had a more general distribution and is now extinct. But that Linnæus was disposed to regard the Virginian species as having been created such as it is, and the Venetian as having originated from that in after times, is enough to warrant our regarding him as an evolutionist.

I shall cite but one more instance of Linnæus's tacit acceptance of species as derived from other species through altered environment. The case is that of the cultivated beet. The genus *Beta*, in his view, consists

¹ Species Plantarum, 2 ed., p. 981.

of two species only: One the *Beta maritima*, indigenous to Old World seashores, a wild plant altogether, and never under cultivation, and, in this wild condition not given to variation, but always one and the same thing. The second species is *Beta vulgaris*, one not known as a wild plant anywhere, but existing from immemorial ages in gardens and fields as a cultivated plant, and that under many marked varieties. Now the short and easy method of dealing with a genus like this—a method many an indifferent systematist would follow—would be to make the guess that, as only one wild species is known, all the cultivated things of that genus are but so many varieties of the one species. The whole tendency of Linnæus's mind was in this direction, that is, of reducing both genera and species to a minimum. But there was a difficulty here with these two members of the genus *Beta*, the simple and unvarying wild kind, and the extremely variable one of cultivation. The cultivated plant was hardy; often ran wild, as it were, by escape from cultivation; but these reverts never were found to be equivalent to *Beta maritima* or anywhere near it. The *Beta vulgaris* self-sown and run wild for years, and greatly

altered from its cultivated condition, yet invariably retained a character of its own; so that no one would think of calling it *Beta maritima*; therefore, with Linnæus the collection of the varieties of cultivation must be admitted as forming a distinct species of which the native original was unknown, and probably long ages ago extinct. To this view of the case he was perhaps inclined; yet not so strongly as to preclude his offering, in a note, this very different suggestion: "Possibly born of *Beta maritima* in some foreign country."¹ The force of this alternative proposition will be lost to any one who does not recall that, according to the Linnæan account of a variety, *Beta vulgaris*, if it originated from seed of *Beta maritima*, originated not as a variety but as a species; and such an origin as he thinks the cultivated beet may have had from the wild one would amount to nothing less than what is now called a mutation; one of those sudden leaps or transitions from one thing to another which we have been learning to take into account only lately.

A like instance confronted Linnæus under the genus *Cynara*, the type of which genus

¹ Species Plantarum, 2 ed., p. 322.

is the true artichoke, and has been cultivated from no one knows how far anterior to all written records. Under this old type species, *Cynara scolymus*, Linnæus admits three marked varieties. Then he proceeds to name and define a second species, a very distinct one, but with a well-authenticated history as having arisen and come into existence as a seedling of the other species. He intimates that he would have liked to be able to consider it a hybrid,¹ but as its parentage as a hybrid could apparently lie nowhere but between two of the three varieties of the other species, the fact would remain that it was a species derived not from two parent species but from one alone. It was another of those abruptly derivative species in which Linnæus was disposed to believe despite those hard half-theologic definitions of his *Philosophia Botanica*.

In the progress of these inquiries into the mind of Linnæus as to the origin of species nothing that I have come upon has more deeply interested me than his remark upon the two species of sundew common in northern Europe, *Drosera rotundifolia* and *D. longi-*

¹ *Species Plantarum*, 2 ed., p. 1159.

folia. They are very peculiar plants, uncommonly interesting from several points of view, and have in recent years profoundly engaged organographers and physiologists; but Linnæus was most interested in their ecology as bearing upon the problem of their genealogy. Both are bog plants, though far enough from being found in every northern bog. They seem to be particular about the kind of soil, the amount of moisture, the nature of the exposure, and also the plant associates amid which they will establish their habitation; and both species are at perfect agreement as to all special details of bog environment which they demand; for where one is found, there too is the other. They are much alike in size, mode of growth, degree of hariness, form and color of flowers, etc., but the leaf blades in one are round, while in the other they are so much elongated as to be called narrowly oblong; and this one strong distinguishing mark is constant. There are no plants among them to show leaves intermediate between orbicular and oblong. They ought to be, and I think that by all botanists except Linnæus, both before his day and ever since, they have been held distinct; and even he did not positively affirm the contrary, but only

expressed a doubt; and the sole reason he has for doubting the validity of *D. longifolia* is, that it and its mate species always occur under precisely the same conditions and together.¹ It is such a reason as none but a confirmed evolutionist could give; the expression, perhaps unguarded, of a mind no longer very patient of the opinion that two species of the same genus can have the same native environment. A creative fiat could, of course, as readily make two species of a genus suited to certain conditions as one, and as easily twenty as two; and so no believer in the special creation of all species could have felt this doubt about the sundews to which Linnæus gave expression.

It has been thought that the mind of Linnæus as to the absolute fixity of species underwent a change between the years 1751 and 1762, though only in so far as to induce him to admit the origin of more recent species by hybridization.² My own impression is that few if any of the plants thought by Linnæus to be hybrids are at all of that origin, according to the views of modern

¹ *Habitat ubique cum præcedente; an itaque satis diversa species?* *Species Plantarum*, 1 ed., p. 282; 2 ed., p. 403.

² Osborn, *From the Greeks to Darwin*, p. 129.

botanists, but rather, for the most part at least, perfectly distinct and genuine species. But what I have herein, I think, clearly shown is not only that Linnæus accepted and admitted to his books, as species, forms he thought of as developed from other species, not by any crossing, but through mere environment—natural environment in some instances, artificial in others. And this bent of his mind was so strong that he could scarcely admit two members of a genus to be specifically distinct if found to occur always under the same physical conditions. Again: while it is generous to allow to the great nature student the eleven years between 1751 and 1762 in which to have changed his views a little as to the fixity of all species, the simple fact is that nowhere were the views set forth in the *Philosophia Botanica* of 1751 more squarely contradicted than in the *Species Plantarum* of 1753. There were two years intervening between the dates on the respective titles; but most likely he was engaged in writing the works, at least in part, simultaneously. But the great man was writing and publishing as other men of genius had done before him, under environment.

In a letter written by Linnæus as early as

1747, addressed to his most intimate and trusted friend, J. G. Gmelin, author of *Flora Sibirica*, he gives confidential expression to the restraints under which he feels that he is obliged to write on matters that impinge upon the domain of theology; to his unwillingness to face the disapproval of the Lutheran and orthodox ecclesiastics who, in his day, ruled the destinies of all seats of learning in Sweden. He says to Gmelin:

"You disapprove my having located Man among the Anthropomorphi. But man knows himself. Now we may, perhaps, give up those words. It matters little to me what name we use; but I demand of you, and of the whole world, that you show me a generic character—one that is according to generally accepted principles of classification—by which to distinguish between Man and Ape. I myself most assuredly know of none. I wish somebody would indicate one to me. But, if I had called man an ape, or vice versa, I should have fallen under the ban of all the ecclesiastics. It may be that as a naturalist I ought to have done so."¹

¹ This, though written as we have said in 1747, was never published until 1861. The original Latin text of the letter occurs in "*Joannis Georgii Gmelini, Reliquiæ quæ, supersunt*

The good orthodox Lutheran ecclesiastics that ruled the Swedish university in every department of it would be thoroughly content with the pronouncements of the *Philosophia Botanica*; and that was a book any scholar would read with pleasure and with profit; but nothing like that could be said of the *Species Plantarum*. Here, at least, in footnotes, or even in places more obscure, very briefly, veiled in figures of rhetoric, and even under the further protection of question marks, he could express his profounder convictions and feel secure. And he was secure, indeed.

commercii epistolici cum Carolo Linnæo Alberto Hallero Guilielmo Stellero et al., *Floram Gmelini Sibericam ejusque Iter sibericum potissimum concernentis, ex mandato et sumtibus Academiæ scientiarum Cæsareæ Petropolitanae publicandas curavit Dr. Guil. Henr. Theodor Plieninger; Stuttgart, 1861,*" p. 55, and is as follows: "Non placet quod Hominem iter anthropomorpha collocaverim; sed homo noscit se ipsum. Removeamus vocabula, mihi perinde erit, quo nomine utamur; sed quæro a Te et Toto orbe differentiam genericam inter hominem et Simiam, quæ ex principiis Historiæ naturalis. Ego certissime nullam novi; utinam aliquis mihi unicam diceret. Si vocassem hominem simiam vel vice versa omnes in me conjecissem theologos. Debuisset forte ex lege artis."